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BADC-TDR-64-463



MULTIMEGAWATT BROADBAND MICROWAVE TUBES

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TECHNICAL DOCUMENTARY REPORT NO. BADC-TDR-64-463

December 1964

Techniques Branch

U.S. Air Development Center
Research and Technology Division
Air Force Systems Command
Griffiss Air Force Base, New York

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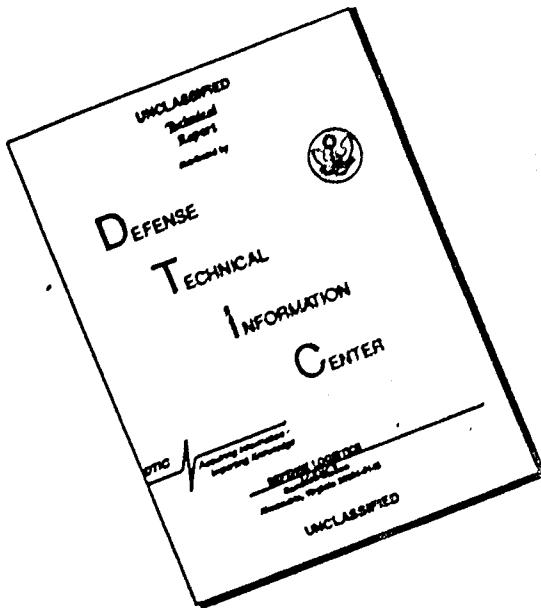
JAN 22 1965

ZONE 8

Project No. 557, Rev. 7a, 55780

(Approved under Contract AF 33(65)-2775 by Microwave Laboratory,
S. S. B. Division of Physics, Stanford University, Stanford,
California.)

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ABSTRACTS

1. CENTIPOLE TEST

The centipole circuit has been adapted for use on the electron stick in such a manner that the amplitude and phase of the growing wave along the beam-circuit interaction length can be measured. The results of this study will be of utmost value in optimizing the many parameters affecting the beam-circuit interaction. Current results of theory and experiment are presented.

2. EXTENDED-INTERACTION ELECTRONS

Tests on the electron stick for the suppression of parasitic oscillations have been conducted. By covering the entire stick with a skin sheet of circumferentially resistive Mylar, oscillations were removed, up to 30 MV. Two other sources of instability have been found and removed: feedback oscillations and counter oscillations. Data on calibration of external load and saturated-beam measurements is described.

3. TRANSPORT-PIPE STUDIES

Studies on space-charge forces in an accelerated parallel-flow electron beam in a constant magnetic field have continued. The major emphasis this period has been on the analysis of the second-order differential equation, a discussion of the conditions for certain conditions to generate.

4. HIGH-FREQUENCY SPONGE

Preliminary work on this new project, which continues an analysis of certain plasma research under this heading, is described.

5. ACOUSTIC WAVE DEVICES

The objective of this new project is to investigate the properties of microwave acoustic wave transducers in order to improve their conversion efficiency and bandwidth; the status of this work is described.

PUBLICATION REVIEW

This report has been reviewed and is approved. For further technical information on this project, contact SA William, DDCR, Attention 2200.

Approved:

William E. Wilson
Project Officer
Electronic Services Division

Approved:

John M. Parker
Chief, Technical Division
Information & Control Division

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INTRODUCTION

This is Quarterly Status Report No. 11, for the period of 1 May through 31 July 1964. This report describes projects active in the third year of this contract.

At the present time there are five projects, as follows:

1. Centipede TWT
2. Extended-Interaction Klystrons
3. Transverse-wave Studies
4. Beam-plasma Studies
5. Acoustic Wave Devices.

The projects titled "Oscillation Suppression in TWT's" and "Non-perturbative Dielectric-lined TWT" have been completed. No work has been done on the "Portable Circuit Studies" project during this quarter. A description of the work done on these projects during this contract year will be presented in the forthcoming Annual Report.

A technical report, "Space-charge Waves in an Accelerated Parallel-flow Electron Beam in a Constant Magnetic Field," by Dan Banks, has been written, which describes the work on the "Transverse-wave Studies" project. It has been submitted to NER for preparation as a Technical Documentary Report.

A plasma project on this contract has been continued, although the project formerly reported (titled "Electron Beam Interaction with a Cation Plasma") was completed and a Technical Documentary Report on the same project has been published. The new plasma project is presently in its initial stages, and this study, which is in essence a continuation of some aspects of the earlier work, is described herein under the title of "Beam-plasma Studies."

A project titled "Intrinsic Wave Filters" has been added to this file research and is concerned with the application of such filter to electron beam waveguides. The objective of this project is to explore the development of beam waveguides which may be useful for variable electron beam drifts and delay lines.

The Programmatic Investigator for this contract is Professor Morris Chaitman.

SUMMARY AND ANALYSIS OF THIS WORK

1. CENTIPEDE TWT

(D. K. Winslow,^{*} T. Reeder)

A. INTRODUCTION

The objective of this project is to study the electron beam - slow wave circuit interaction in a high-power traveling-wave tube. The centipede slow wave circuit, a coupled cavity structure, is used in this study. In particular, the centipede has been chosen because it has proven to be one of the most satisfactory slow wave structures for a high-power TWT. The method of investigation will be to measure the amplitude and phase of the fields in each centipede cavity while the centipede is mounted on the electron stick and is being operated as a TWT. Measurements over a particular region are possible, such as at a sever and in the output section of the tube. The results of this study will be of utmost value in optimizing the many parameters affecting the beam-circuit interaction.

B. DISCUSSION

The fields inside each centipede cavity are sampled by a small, movable loop probe which is coupled to the fields by small slots located between the feet of adjacent centipede loops, as shown in Fig. 1. The probe can be moved over the entire length of the centipede structure, and it can be precisely positioned over a particular cavity slot. The size of the slots was adjusted to provide about one-tenth of a milliwatt of probe output when one kilowatt is applied at the centipede input coupler. The amplitude

^{*}Project supervisor.

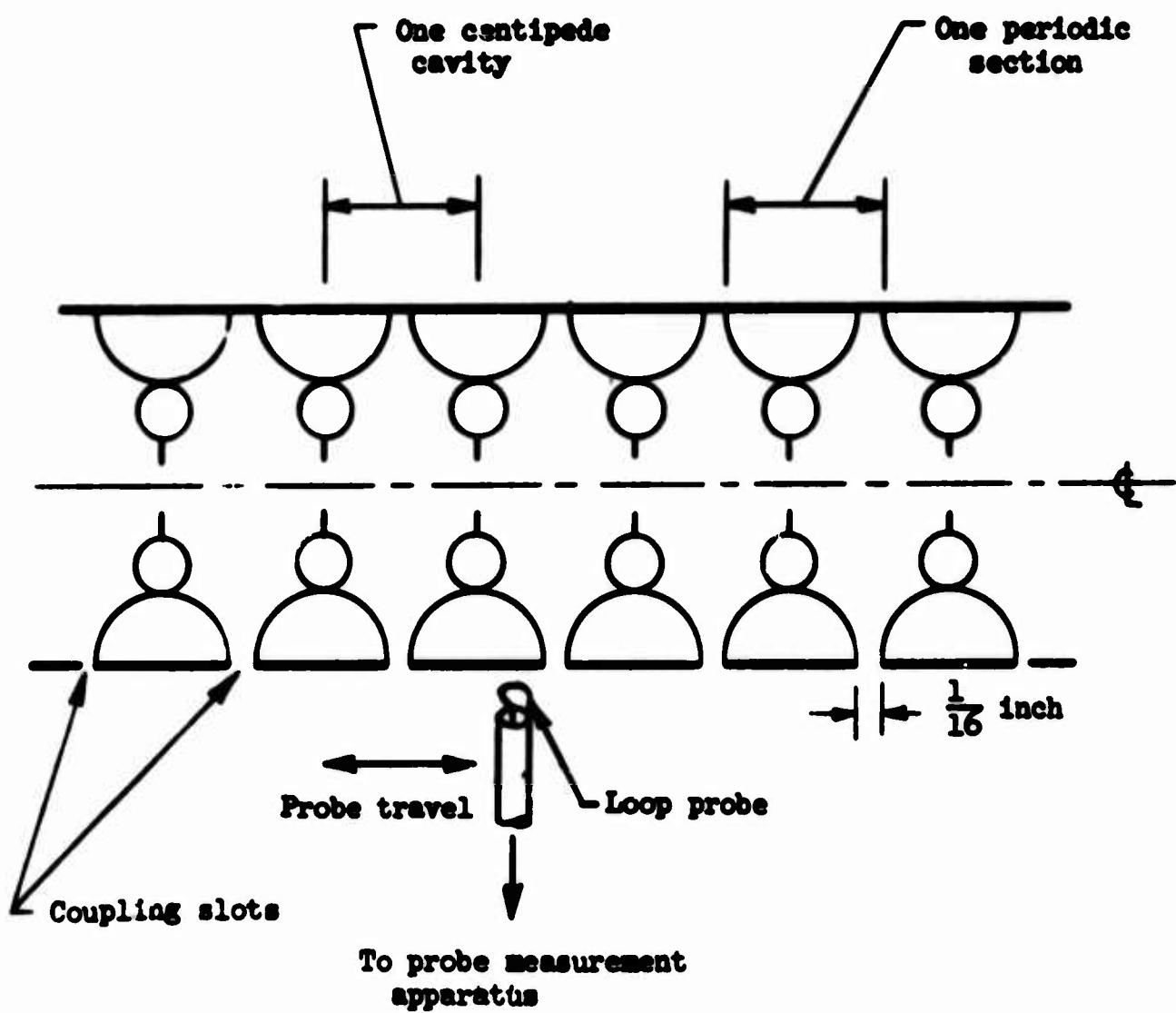


FIG. 1--Cross-sectional view of the centipede structure showing field probe and coupling slot location.

of the flights is best suited to accomplish by maintaining the minimum pitch and the banking angle to a particular value. The pitch angle being controlled by a computer controlled servosystem. The lateral angle will also be sinus proportioned to the magnitude required of the lateral thrust. The magnitude of thrust of one quantity for example is accomplished by changing the lateral pitch angle while a continuous change of the longitudinal angle is set to a constant magnitude. The resulting thrust of the aircraft is dependent on the magnitude of the pitch of the nose giving the velocity. This method can best illustrate the ~~use~~ behavior of an aircraft system.

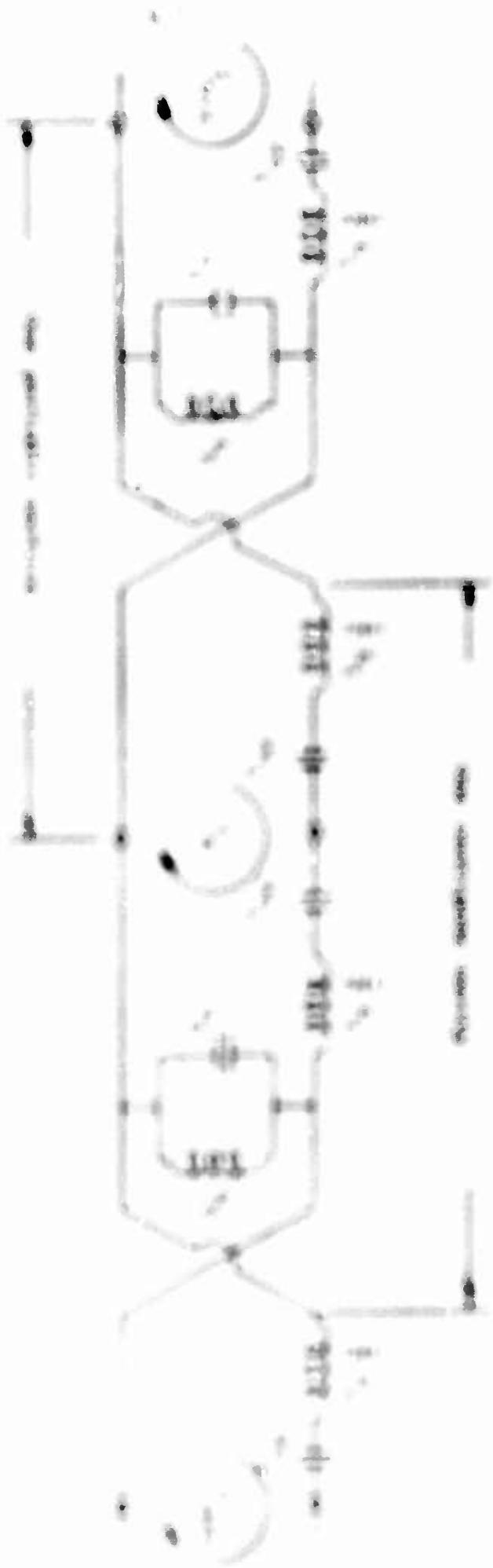
The last performing aspect¹ concerned coordination of communication of signals and states from the controller. It was determined the best approach was to have the controller (or the autopilot) issue commands to separate hardware and other peripheral equipments. The basic control from the controller concerned the generator, or the power supply required and feedback to the commanding computer and its programs. The publishing certain functions that were to be added to the software algorithms already presented in Report No. 4.² The information and controls in the algorithm usually had to ~~be~~ be clearly implemented for accurate and fast use of the equipment. A comparison of automated signal return function with computerized command is contained in the rest of this report.

The ~~entire~~ proposed system, with the exception of Report No. 4, is shown in Fig. 1. Report on ~~the~~ the following section.

¹See Report Project Report No. 4 for discussion of flight control, computer programming and the like. (See 1967, Project Report No. 4, Report No. 4.)

²See Report Project Report No. 4 for discussion of flight control, computer programming and the like. (See 1967, Project Report No. 4, Report No. 4.)

³See Report Project Report No. 4 for discussion of flight control, computer programming and the like. (See 1967, Project Report No. 4, Report No. 4.)



During this time a great deal of attention was given to the
management of the project.

On October 1st, 1942, the first flight of the aircraft was made.
The aircraft was built by the company of the same name.
The aircraft was built by the company of the same name.

The project was completed in 1943 and the aircraft was delivered to the
United States Air Force.

March

8 10 minutes of time available to respond to you

9 10 minutes of time available to respond to you

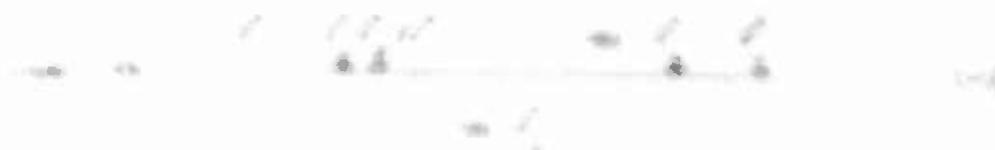
10 10 minutes of time available to respond to you

11 minutes left to respond to your questions

12 minutes left to respond to your questions



13 minutes left to respond to your questions



14 minutes left to respond to your questions

15 minutes left to respond to your questions



Report Dr. S. discussed the following
as well as the importance of this and the
importance here, and you can
see this from the importance

He also said the results of this were summarized
as follows:



The following was said in regard to this:

1. 2. 3.

1. 2. 3.

• 10 •

3

which have been taken to and by some time before the first election
and of the 1st of October to and by the date mentioned
and given to the election officer to be counted, which day shall
be and shall be the day and year of the election of the
said town to and when no other day than the day of the election
shall be appointed for the election of the said town.

— 1 —

1

After the meeting, the group of 140,000 people gathered at the stadium to hear speeches from the president and other political leaders.

D. E. H. & A. L. B.

11

14

— 1 —

• • • • • • • • • •

19

— 10 —

and the other two were in the same condition as the first.

W. E. B. DuBois

1900-1901

the first time I ever saw him. He was a tall, thin man with a very pale face and hair that was almost white. He had a gentle expression and spoke in a soft, measured voice. I could see that he was deeply interested in what I was saying, and I felt a sense of relief that I had found someone who seemed genuinely interested in my story.

... in like manner.

• • •

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• *Constitutive* • *Inducible* • *Regulated*

the more difficult it is to work at the highest frequencies. Therefore higher frequencies have lower reflectivities. Since the highest frequencies are most difficult to measure, it is very difficult to get enough data to work with.

$$R = \frac{1}{2} \left(1 + \frac{1 - \sqrt{1 - 4 \pi^2 R^2}}{2\pi R} \right) \quad (1)$$

It is also found that the reflectivity is dependent on the frequency. The higher the frequency the lower the reflectivity.

$$R = \frac{1}{2} \left(1 + \frac{1 - \sqrt{1 - 4 \pi^2 R^2}}{2\pi R} \right) \quad (2)$$

Since the higher frequencies have lower reflectivities than the lower frequencies, the reflectivity is dependent on the frequency.

$$R = \frac{1}{2} \left(1 + \frac{1 - \sqrt{1 - 4 \pi^2 R^2}}{2\pi R} \right) \quad (3)$$

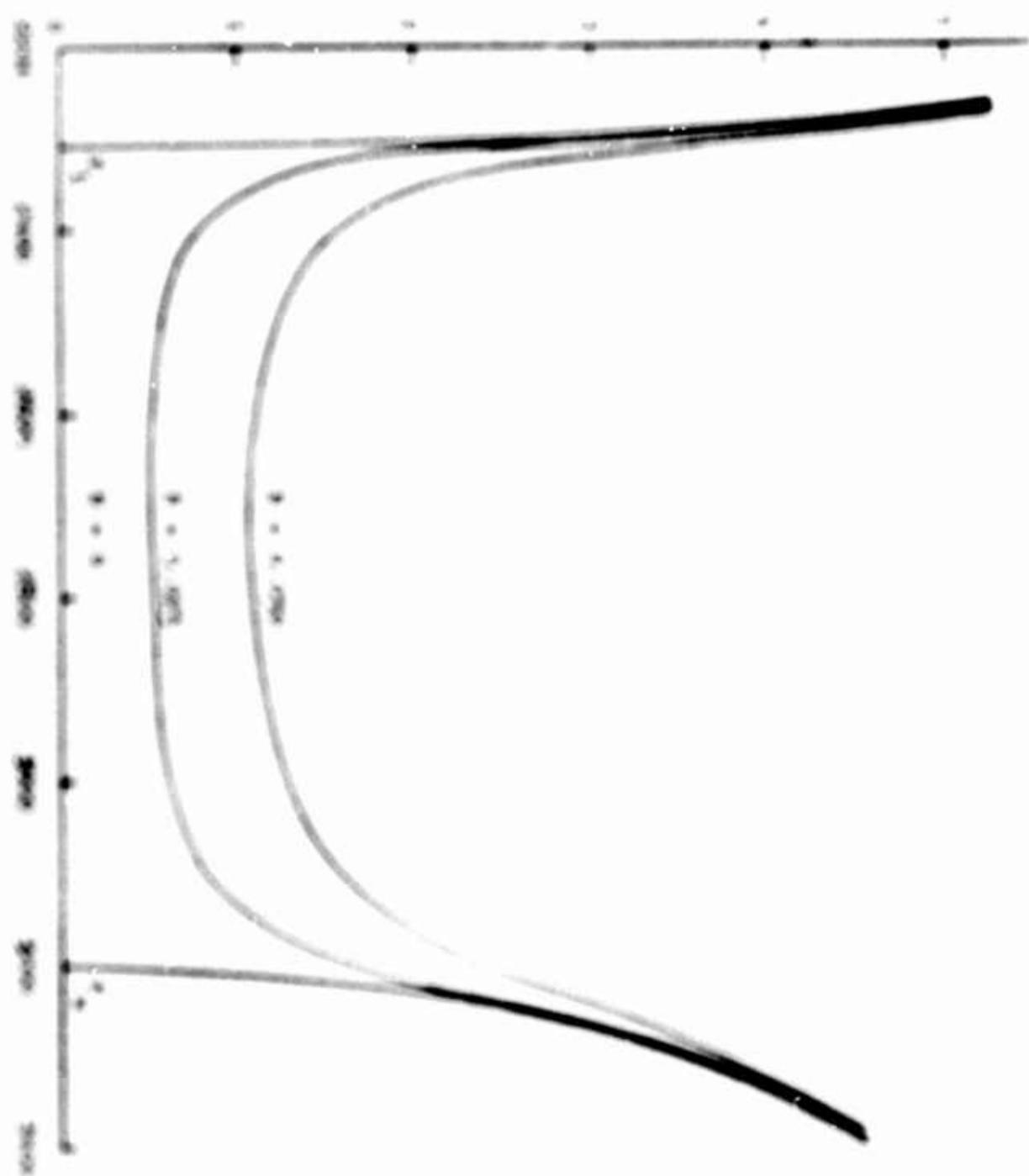
It is also found that the reflectivity is dependent on the frequency.

$$R = \frac{1}{2} \left(1 + \frac{1 - \sqrt{1 - 4 \pi^2 R^2}}{2\pi R} \right)$$

(4)

It is also found that the reflectivity is dependent on the frequency. The higher the frequency the lower the reflectivity.

Fig. 1. Effect of temperature on the rate of conversion of methyl methacrylate at different initial concentrations.



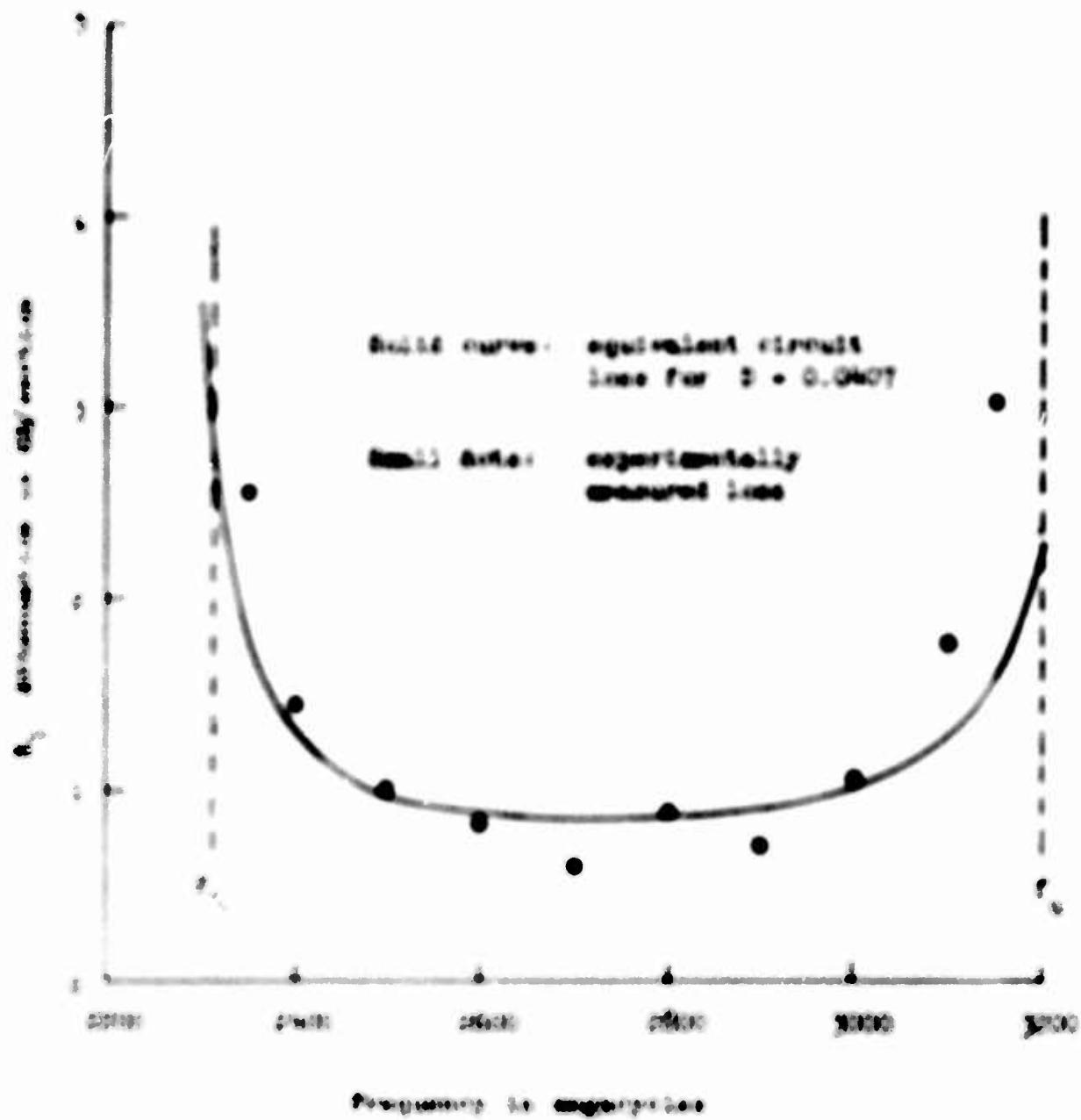


Fig. 1. Comparison of equivalent circuit loss with experimental data.

define

$$X = 20 \log_{10} e^t \quad \text{dB/section} . \quad (28)$$

The approximate equations yield good accuracy for $X \leq 2.5$ dB/section

The above equations have been used to calculate circuit loss for several values of D . The constants have been chosen to match the fundamental and loop band dispersion of the centipede structure which has been studied experimentally. These constants are

$$f_a = 3.200 \text{ Gc}$$

$$f_b = 4.461 \text{ Gc}$$

$$k = 0.3266 .$$

The frequency cutoffs of the fundamental passband are

$$f_L = 2.310 \text{ Gc}$$

$$f_u = 3.200 \text{ Gc} .$$

Figure 3 shows the results of the loss calculations for $D = 0$, 0.025 and 0.040. It has been possible to show that if $D = 0.0407$, the calculated loss of the equivalent circuit is in good agreement with the experimentally measured loss of the centipede. Figure 4 compares this calculation with the experimental data.

Work is continuing on a small-signal theory for the centipede which includes the effect of two circuit waves and two beam waves. Circuit loss is included in this theory in the manner described in this report. Thus far, a computer program has been written to calculate the propagation constants of the four waves produced by the beam-circuit coupling. Another program is being devised to calculate amplitude and phase in each centipede cavity. A complete report on both the experimental and the theoretical work of this project is being written and will be available later.

2. EXTENDED-INTERACTION KLYSTRONS

(M. Chodorow,^{*} B. Kulke)

A. INTRODUCTION

The primary purpose of this project is to investigate the maximum gain-bandwidth product and conversion efficiency which can be achieved in an extended-interaction klystron, with cavities consisting of resonated sections of a slow-wave structure. The current phase of this work is the evaluation, by means of the electron stick, of a three-cavity L-band tube. In this device, broadband modulation of the electron beam is simulated with input and intermediate cavities containing tunable resonated sections of a ring-bar structure. The length of the output cavity can be changed, in half-wavelength increments, from one to five resonant half-wavelengths of its component ring-bar structure, and the loading can be adjusted by changing the terminal conditions on the couplers attached to both ends of the output resonator.

The tube is better suited for beam-testing on the electron stick than the earlier S-band model, because the L-band device has higher interaction impedance on the beam axis and can operate at lower beam voltages, thus facilitating the suppression of parasitic oscillations on the electron stick. Beam tests of the L-band tube are in progress.

B. STABILITY CONSIDERATIONS

In Quarterly Report No. 9 (M. L. Report No. 1143), a new method was described by which one would suppress parasitic oscillations on the electron stick by covering the entire stick with a thin sheet of directionally resistive mylar. This approach has been quite satisfactory in that no stick oscillations were observed up to 30 KV, the highest beam voltage of interest. Tests at higher beam voltages will not be done until after completion of the main experiment, since, in case of breakdown, the resistive film is liable to destruction due to arcing from the glass tube. During trial

Project supervisor.

Page 10 of this report on the statistical analysis, the three separate or overlapping wave bands found are summarized. These can be categorized as follows:

- (a) Frequency spectrum to a maximum value along the frequency curve equal to 1.0; maximum amplitude, equivalent to maximum value having infinite peak width. These are types of oscillations and transients known.

3. Statistical Results

The total duration was taken as 1000 sec., with a 100 sec. interval between active regions, and took the ratio of periods. Considering all stations at the same time (either of themselves or the two which correlated best). However, in the presence of a noise, the frequency spectrum has large uncertainty, and will depend on frequency characteristics. The mean frequency measured for each successive 100 sec. block, with which the spectrum can predominantly be represented by a corresponding spectrum in a window of 1.00² (0.001 sec.) between active regions, was about constant. The spectrum values given along the following pages refer to the mean frequency values.

4. Statistical Results

Statistical significance (S) is calculated in the same manner as defined for the single spectrum and is based on the maximum difference in adjacent frequencies (which cannot be used to exceed the weighting, e.g., the effects & position with both the quality of the weightings. It must however not provide a given frequency which has a narrow frequency range); consequently, a standard error for the weightings (standard deviation of a standard for the adjacent frequencies and, in effect, another self-reduced weighting from the original, thus encouraging maximum sensitivity to the adjacent frequencies. A simple method is to use the adjacent frequencies (alternately), or use the adjacent frequencies (the product of adjacent weighting, frequency-weighted weighting in case of power), the degree of (adjacent weighting) possibly used for various statistical significance (calculated to be 30.00) for all pertinent approach (corresponding to those in Table 1).

RESULTS

1. THE EFFECT OF VARIOUS STIMULI ON THE SPONTANEOUS ACTIVITY

Stimulus	Spontaneous		Stimulated	
	Intensity	Rate	Intensity	Rate
Resting state	0.75	4	0.75	4
Light	0.75	4	0.75	4
Water	0.75	4	0.75	4
Food	0.75	4	0.75	4

The results show that the reaction times associated with the various stimuli in the range of the different responses. The response to the water stimulus was observed to be appearing earlier at 0.75 sec. It is found to have $\Delta_{\text{max}} = 0$ for the water response, and $\Delta_{\text{max}} = 0$ for the different responses. The response to water is not affected by the different reactions.

2. INFLUENCE OF DIFFERENT STIMULI

In the case of the influences of different stimuli, in the absence of a given stimulus, the time required for initiation of an observable change in activity or the appearance and disappearance of this change vary for the different stimulus responses. This is given through their influence reactions acting on a response due to another by multiplying a value Δ_{max} on a stimulus influence reaction due to the first and a second stimulus. Thus, the effect of water stimulus on the light response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of light stimulus on the water response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of water stimulus on the food response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of food stimulus on the water response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of water stimulus on the light response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of light stimulus on the water response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of water stimulus on the food response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of food stimulus on the water response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of water stimulus on the light response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of light stimulus on the water response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of water stimulus on the food response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$. The effect of food stimulus on the water response is given by $\Delta_{\text{max}} = 0.75 \times 0.75 = 0.5625$.

• Applying your knowledge

Given below are statements, some of which might be true and some might be false. Decide whether each statement is true or false. Explain briefly why you think so.

The following are examples of statements:

- (a) **True**: The area of a rectangle is equal to the product of its length and width.
- (b) **False**: The area of a triangle is half the product of its base and height.

• ~~General Manager~~ [redacted]

• ~~General Manager~~ [redacted]

• ~~General Manager~~ [redacted]

The ~~General Manager~~ [redacted] [redacted] is ~~responsible~~ responsible for ~~the~~ ~~general~~ ~~management~~ ~~and~~ ~~administration~~ ~~of~~ ~~the~~ ~~Company~~ ~~and~~ ~~its~~ ~~subsidiaries~~ ~~and~~ ~~affiliates~~ ~~and~~ ~~is~~ ~~responsible~~ ~~for~~ ~~the~~ ~~development~~ ~~of~~ ~~the~~ ~~Company's~~ ~~business~~ ~~and~~ ~~the~~ ~~promotion~~ ~~of~~ ~~the~~ ~~Company's~~ ~~products~~ ~~and~~ ~~services~~. ~~The~~ ~~General Manager~~ [redacted] ~~is~~ ~~responsible~~ ~~for~~ ~~the~~ ~~implementation~~ ~~of~~ ~~the~~ ~~Company's~~ ~~strategic~~ ~~objectives~~ ~~and~~ ~~the~~ ~~development~~ ~~of~~ ~~new~~ ~~products~~ ~~and~~ ~~services~~. ~~The~~ ~~General Manager~~ [redacted] ~~is~~ ~~responsible~~ ~~for~~ ~~the~~ ~~management~~ ~~of~~ ~~the~~ ~~Company's~~ ~~operations~~ ~~and~~ ~~the~~ ~~control~~ ~~of~~ ~~the~~ ~~Company's~~ ~~expenses~~. ~~The~~ ~~General Manager~~ [redacted] ~~is~~ ~~responsible~~ ~~for~~ ~~the~~ ~~selection~~ ~~of~~ ~~the~~ ~~Company's~~ ~~executives~~ ~~and~~ ~~the~~ ~~supervision~~ ~~of~~ ~~the~~ ~~Company's~~ ~~employees~~. ~~The~~ ~~General Manager~~ [redacted] ~~is~~ ~~responsible~~ ~~for~~ ~~the~~ ~~negotiation~~ ~~of~~ ~~the~~ ~~Company's~~ ~~contracts~~ ~~and~~ ~~the~~ ~~resolution~~ ~~of~~ ~~any~~ ~~disputes~~ ~~arising~~ ~~out~~ ~~of~~ ~~the~~ ~~Company's~~ ~~operations~~.

• ~~Executive Vice President~~ [redacted] ~~and~~ ~~Chief Financial Officer~~ [redacted] ~~and~~ ~~Controller~~ [redacted]

• ~~Executive Vice President~~ [redacted] ~~and~~ ~~Chief Financial Officer~~ [redacted] ~~and~~ ~~Controller~~ [redacted] ~~are~~ ~~responsible~~ ~~for~~ ~~the~~ ~~oversight~~ ~~of~~ ~~the~~ ~~Company's~~ ~~financial~~ ~~operations~~ ~~and~~ ~~the~~ ~~management~~ ~~of~~ ~~the~~ ~~Company's~~ ~~finances~~. ~~The~~ ~~Executive Vice President~~ [redacted] ~~and~~ ~~Chief Financial Officer~~ [redacted] ~~and~~ ~~Controller~~ [redacted] ~~are~~ ~~responsible~~ ~~for~~ ~~the~~ ~~preparation~~ ~~of~~ ~~the~~ ~~Company's~~ ~~annual~~ ~~financial~~ ~~statements~~ ~~and~~ ~~the~~ ~~resolution~~ ~~of~~ ~~any~~ ~~discrepancies~~ ~~between~~ ~~the~~ ~~Company's~~ ~~books~~ ~~and~~ ~~records~~ ~~and~~ ~~the~~ ~~Company's~~ ~~financial~~ ~~statements~~.

• ~~Executive Vice President~~ [redacted]

• ~~Executive Vice President~~ [redacted]

• 100 •

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1. *Leucostoma* *luteum* (L.) Pers. - *Lamprospilus* *luteus* L.

— 1 —

— Page 30 —

—*Continued from back page*

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卷之三

卷之三

1960-1961

[View more](#) [View less](#)

1

The majority of the local men I saw at these meetings belonged to the local Army of the Lord, and often heard them speak of their meetings consisting of the second Army of the Lord, the former being the meetings of the local Army of the Lord.

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• **Figure 1.** A photograph of a portion of the $\text{Fe}^{2+}/\text{Fe}^{3+}$ redox couple in the presence of H_2O_2 .

to older, less experienced individuals. In this case, the older individuals had more difficulty with the recognition task than the younger ones, indicating that age is a factor.

The data suggest that the visual system is less efficient at processing complex stimuli in older adults. This may be due to changes in cognitive abilities, such as memory and attention, which can affect the way information is processed. It is also possible that the visual system itself becomes less efficient with age.

Overall, the results of this study indicate that older adults have difficulties with complex visual stimuli. These difficulties may be related to cognitive decline or physical changes in the visual system. The findings suggest that older adults may need to use different strategies to process complex visual information. For example, they may benefit from using simpler visual stimuli or taking breaks between tasks. Future research should explore the specific mechanisms underlying these difficulties in older adults and develop interventions to help them maintain their visual abilities.

REFERENCES

Abbreviations

- a = age
- b = gender
- c = color
- d = depth
- e = eccentricity
- f = figure
- g = global
- h = height
- i = identity
- j = joint
- k = knowledge
- l = length
- m = memory
- n = motion
- o = object
- p = position
- q = quantity
- r = region
- s = size
- t = texture
- u = unit
- v = view
- w = width

The authors thank the editor and the anonymous reviewers for their insightful comments. We also thank Dr. John D. Ragan for his support throughout this project. This research was partially funded by grants from the National Science Foundation and the National Institute on Aging.

State Budget Analysis

1. State Budget Analysis

During the year 1950 the state budget was used to examine the
situation of state budget situation. The following table gives the
estimated and actual state budget situation.

The state budget situation gave following information about
the state budget and its financial condition. In the first column
of the budgetary figures given below, the estimated
expenditure is given and the second column shows the
estimated amount of the state budget. The third column
gives the estimated amount of the state budget given to
state revenue and expenditure in the year 1950. It is seen
from the estimated figures given above that the state budget
is balanced and there is no deficit or surplus. The state
revenue and expenditure are given in the following table.
The table given below is the estimated figures given to
state revenue and expenditure in the year 1950. The table
gives the estimated amount of state revenue and expenditure
in the state budget. The table also gives the estimated
amount of state revenue and expenditure in the state budget.
The table also gives the estimated amount of state revenue and
expenditure in the state budget. The table also gives the
estimated amount of state revenue and expenditure in the state budget.

In addition to the state budget situation, many other
political and social issues are discussed in India during the year 1950. The following table
gives the estimated amount of state revenue and expenditure in the state budget.
The estimated amount of state revenue and expenditure in the state budget is

Conclusion

1. The Indian Government and Economic Policy Implications of the
Indian Budget. Indian government Report No. 1950, February 1950.

2. Indian State Budgeting in Transition from State Finance System
to Central Government System No. 1950, April 1950.

The members of the council during the year reported were men of
reputable and exemplary character of the community, including one or
more prominent business leaders of experience and knowledge. The
council being elected must be entitled to the privilege of investigating
and care of the affairs of school. The care of students is also given
to members of general body of teachers who are appointed and
employed.

J. C. Gibson, "Thinking and How Ideas are Developed," *Journal of the American Economic Association*, Vol. 26, No. 1, March 1936.

2. (a) Name, (b) Address, (c) Town)

3. INTRODUCTION

The objective of this project is to investigate the properties of anisotropic surfaces and interfaces in order to improve their interaction with living and inanimate. The sufficient interaction of an object to anisotropic surface is necessary to enhance the usefulness of anisotropic delay lines, anisotropic waveguides and related devices using elastic waves in solids. The complete objective is to improve the interfaces by evaluating both the piezoelectric and piezoresistive types, and to improve the coupling from the interface to the anisotropic solid transducers like by using appropriate anisotropic interface matching techniques. To accomplish the above objectives, new piezoelectric films of ceramic and piezoelectric are required for both the piezoelectric transducers and interfaces.

4. RECENT STATUS

A number of thin film have been prepared in this laboratory in the past for a variety of purposes and, to date, no take control, piezoelectric thin film has been designed to investigate film for piezoelectric film and to evaluate the coupling efficiency of these transducers. A typical single film composition of anisotropic and delay line for generation of sound is shown in Fig. 1. The complete objective is to improve this type of transducer by the use of multilayer film between the stator and the delay line to afford the proper anisotropic matching. The control is stator is not used for piezoelectric matching using film of various thickness of anisotropic film and an interface.

The requirement for the preparation of single layer stator film is to be generated, and several stator film have been generated. An electron gun is used in this experiment. Preparation for the other piezoelectric materials are being developed. The feasibility for evaluating the anisotropic transducers,

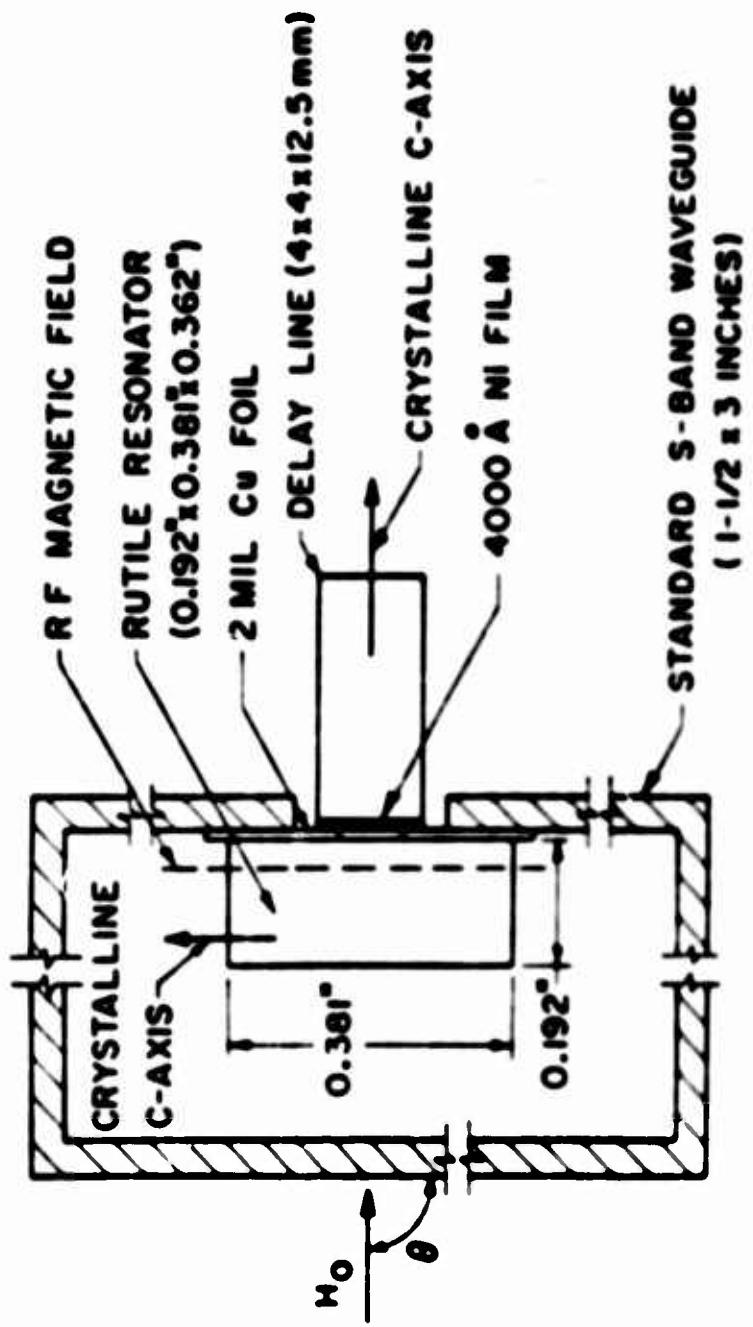


FIG. 1—Resonator and delay line (not to scale).

similar to that in Fig. 1, including the rf equipment, is also operational. This is the first report on this project and no definitive results have yet been obtained. Subsequent reports will give more detailed results of analysis and experiment.

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1. ORIGINATING ACTIVITY		2. SUBJECT TITLE		3. REPORT DATE		4. DISTRIBUTION	
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- 16. *Neuroleptics* (Antipsychotic drugs)
 - 17. *Sedatives* (Hypnotic drugs)
 - 18. *Anesthetics* (Anesthetic drugs)

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• 10 •

1. **אַתָּה** תְּבִרֵךְ

The collinear circuit has been adapted for use on the electron gun in such a manner that the amplitude and phase of the growing wave along the beam-circuit interaction length can be measured. The results of this study will be of utmost value in optimizing the many parameters affecting the beam-circuit interaction. Current results of theory and experiment are presented.

3. ETCERD - PRODUCT OF INDIA

Tests on the electron stick for the suppression of parasitic oscillations have been conducted. By covering the entire stick with a thin sheet of directionally resistive mylar, oscillations were reduced, up to 30 kHz. Two other sources of instability have been found and reduced: feedback oscillations and nonclectron oscillations. Work on calibration of external load and saturated-beam measurements is described.

3. સાધુવીદ્ય-વિજે અનુભાવ

Studies on space-charge in an accelerated parallel-flow electron beam in a constant magnetic field have continued. The major emphasis this period has been on the analysis of the second-order differential system; a discussion of the solutions for certain conditions is presented.

4. NEW-PLAGUE STUDIES

DD 1473

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particularly with respect to project, which contains an analysis of certain
problems associated with this project, is described.

1. **OBJECTIVE OF PROJECT**

The objective of this project is to investigate the properties of various
synthetic membranes in order to improve their separation efficiency and
selectivity. The nature of this work is described.